

WHAT IS CLAIMED IS:

1 1. An intake apparatus for an internal combustion engine,
2 the internal combustion engine including a cylinder head
3 that defines a plurality of engine cylinders and an intake
4 port connected to each of the engine cylinders, and an
5 intake manifold connected with the intake port, the intake
6 apparatus comprising:
7 a partition extending in a longitudinal direction of the
8 intake port so as to divide an inside region of the intake
9 port into a first passage and a second passage; and
10 a gas motion control valve disposed at a downstream end
11 of the intake manifold and adjacent to an upstream end of
12 the partition, the gas motion control valve including a
13 rotatable valve element and having a full-closed position
14 where the valve element fully closes the second passage of
15 the intake port and a full-open position where the valve
16 element fully opens the second passage of the intake port,
17 the valve element and the partition cooperating with each
18 other to define an interspace between the valve element and
19 the upstream end of the partition when the gas motion
20 control valve is in the full-closed position.

1 2. The intake apparatus as claimed in claim 1, wherein the
2 gas motion control valve comprises a rotatable valve shaft
3 on which the valve element is supported, the valve shaft
4 being located on a plane extending from the partition, the
5 valve element being aligned in plane with the partition when
6 the gas motion control valve is in the full-open position.

1 3. The intake apparatus as claimed in claim 1, wherein the
2 valve element partially projects toward the first passage of
3 the intake port when the gas motion control valve is in the
4 full-closed position.

1 4. The intake apparatus as claimed in claim 2, wherein the
2 valve element comprises a main portion extending in one
3 direction from the valve shaft so as to fully close the
4 second passage when the gas motion control valve is in the
5 full-closed position, and an extension portion extending in
6 an opposite direction from the valve shaft, the extension
7 portion projecting toward the first passage when the gas
8 motion control valve is in the full-closed position, the
9 extension portion being positioned so as to minimize the
10 interspace when the gas motion control valve is in the full-
11 open position.

1 5. The intake apparatus as claimed in claim 5, wherein the
2 partition is in the form of a plate as an insert inserted
3 into the cylinder head upon casting the cylinder head.

1 6. The intake apparatus as claimed in claim 1, wherein the
2 upstream end of the partition extends straight along an
3 intake manifold mount surface of the cylinder head onto
4 which the intake manifold is mounted, the upstream end of
5 the partition being flush with the intake manifold mount
6 surface.

1 7. The intake apparatus as claimed in claim 1, wherein the
2 upstream end of the partition is located downstream of an
3 intake manifold mount surface of the cylinder head onto
4 which the intake manifold is mounted.

1 8. The intake apparatus as claimed in claim 1, wherein the
2 second passage of the intake port is a lower region of the
3 intake port that is located below the partition in an up-
4 and-down direction of the engine cylinder, the first passage

5 of the intake port being an upper region of the intake port
6 that is located above the partition in the up-and-down
7 direction of the engine cylinder.

1 9. The intake apparatus as claimed in claim 1, wherein the
2 valve element is inclined to guide an intake air flow to the
3 first passage of the intake port when the gas motion control
4 valve is in the full-closed position.

1 10. The intake apparatus as claimed in claim 1, wherein the
2 upstream end of the partition comprises a cutout portion
3 recessed toward a downstream side of the partition, the
4 cutout portion being located at substantially a middle
5 position in a lateral direction of the partition.

1 11. The intake apparatus as claimed in claim 10, wherein
2 the cutout portion of the upstream end of the partition is
3 tapered toward the downstream side of the partition.

1 12. The intake apparatus as claimed in claim 10, wherein
2 the gas motion control valve comprises a rotatable valve
3 shaft on which the valve element is supported, the upstream
4 end of the partition including two side portions spaced from
5 each other in the lateral direction of the partition,
6 between which the cutout portion is located, the two side
7 portions having lateral peripheral edges extending parallel
8 to the valve shaft, respectively.

1 13. The intake apparatus as claimed in claim 10, wherein
2 the valve element comprises a downstream end shaped to be
3 substantially complementary to the cutout portion of the
4 upstream end of the partition when the gas motion control
5 valve is in the full-open position.

1 14. The intake apparatus as claimed in claim 11, wherein
2 when the gas motion control valve is in the full-closed
3 position, the interspace is larger between the cutout
4 portion of the upstream end of the partition and the valve
5 element and smaller between the two side portions of the
6 upstream end of the partition and the valve element.

1 15. The intake apparatus as claimed in claim 10, further
2 comprising a blowby gas passage extending through the
3 cylinder head into the intake port, the blowby gas passage
4 having one end that is open into the first passage of the
5 intake port and located on a downstream side of the gas
6 motion control valve.

1 16. The intake apparatus as claimed in claim 15, wherein
2 the second passage of the intake port is a lower region of
3 the intake port that is located below the partition in an
4 up-and-down direction of the engine cylinder, the first
5 passage of the intake port being an upper region of the
6 intake port that is located above the partition in the up-
7 and-down direction of the engine cylinder, the internal
8 combustion engine further comprising a fuel injector mounted
9 into the cylinder head above the intake port, the blowby gas
10 passage extending aside the fuel injector, the one end of
11 the blowby gas passage being located in an upper wall
12 surface defining the first passage of the intake port and
13 offset from a plane that extends in the up-and-down
14 direction of the engine cylinder and contains a central axis
15 of the intake port which extends in the longitudinal
16 direction thereof.

1 17. The intake apparatus as claimed in claim 15, wherein
2 the one end of the blowby gas passage is positioned at
3 substantially a middle of a length of the first passage of
4 the intake port.

1 18. An intake apparatus for an internal combustion engine,
2 the internal combustion engine including a plurality of
3 engine cylinders, the intake apparatus comprising:
4 an engine block defining an intake port adapted to be
5 connected to each of the engine cylinders;
6 split means for dividing an inside region of the intake
7 port into a first passage and a second passage which extend
8 in a longitudinal direction of the intake port; and
9 valve means for controlling intake air flowing into the
10 second passage of the intake port, the valve means
11 cooperating with the split means to recirculate a part of
12 intake air flowing toward the engine cylinder through the
13 first passage of the intake port, to an upstream end of the
14 first passage of the intake port through the second passage
15 of the intake port when the valve means prevents the intake
16 air flowing into the second passage of the intake port.

1 19. The intake apparatus as claimed in claim 18, wherein
2 the split means comprises backflow reducing means for
3 reducing backflow of the intake air from the upstream end of
4 the first passage of the intake port to an upstream end of
5 the second passage of the intake port when the valve means
6 prevents the intake air flowing into the second passage of
7 the intake port.

1 20. The intake apparatus as claimed in claim 18, wherein
2 the engine block comprises a blowby gas passage for
3 delivering blowby gas to the first passage of the intake

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4 port, the blowby gas passage having an end located
5 downstream of the valve means.